4.0 AFFECTED ENVIRONMENT

4.1 Water Quality

Cuyahoga Valley National Park has more than 200 miles of perennial and ephemeral streams, including the portion of the Cuyahoga River within its borders. Ten of 14 use impairments have been identified for the lower 45 miles of the Cuyahoga River through the Remedial Action Plan process. These environmental problems are caused by eutrophication (excess nutrients), toxic substances (PCBs, heavy metals), bacterial contamination, habitat modification, and sedimentation.

Water quality in the Park has been monitored by CVNP since 1984 and the streams generally comply with the State of Ohio water quality standards for warm water habitat. After examining trend data, five park tributaries were selected in 1994, placed on an intensive monitoring schedule, and sampled monthly from May through October. These streams: Brandywine, Stone, Sagamore, Tinkers, and Spring Creek, have consistently indicated problems with bacteria, nitrogen, phosphorous and chloride - all sewage related problems. In 1996, Sagamore and Stone Creeks were removed from the intensive monitoring due to improvements in water quality. An upstream site on Spring Creek was added in 1996 due to high levels of chlorides detected in the previous sampling season.

Approximately twenty-three miles of the Cuyahoga River meander through the Park.

Twenty-three miles of the Cuyahoga River flow through CVNP. The water quality of this portion of the river is a primary concern to Park officials, as the river receives discharges of storm water and combined-sewer overflows from urban areas. The Park discourages any canoeing, swimming, or wading in the river, primarily because of concerns related to pathogens. Cuyahoga Valley National Park is working with the United States Geological Survey to study concentrations of indicator organisms associated with the presence of pathogens. The study should be complete in the fall of 2003.

Additionally, the Cuyahoga River continues to be monitored for several water quality parameters once a month from May through October at Ira and Station Roads (approximate river miles 33

and 13, respectively). These monitoring efforts have shown that, in general, water quality deteriorates during precipitation events. For example, 107 samples were collected in the mainstem Cuyahoga River within CVNP from December 1999 to August 2000. The average fecal coliform and E. Coli. bacteria counts were 2885 and 1630, respectively, but were as high as 48,000 and 27,000, respectively during runoff events. Metals exhibited a similar relationship to runoff (concentrations often increasing by an order of magnitude), but nutrient loadings appear to be influenced by factors in addition to runoff.

In response to its responsibilities under Section 303(d) of the CWA the Ohio EPA identified the Lower Cuyahoga River watershed as a priority impaired water on the 1998 303(d) list. The primary causes of this impairment on the mainstem Cuyahoga River itself include organic enrichment/dissolved oxygen and siltation. Other causes in the watershed include nutrients, bacteria, flow alteration, toxicity and degraded habitats. Major sources include "municipal and industrial point sources, combined sewer and sanitary sewer overflows and to a lesser extent natural conditions." (Ohio EPA, 2003).

The riverbank management program is it likely to impact water quality considerations associated with point source discharges of pollutants, or those associated with storm water runoff. However, decisions regarding the approach to protect the banks could influence four water quality parameters for the mainstem Cuyahoga River and its tributaries. These parameters area all directly or indirectly related to the impairment discussed in the previous paragraph, and are discussed below.

a. Dissolved Oxygen - Dissolved oxygen is an indicator of depressed oxygen levels and can be caused by sediment loading. Levels of dissolved oxygen less than 4.0 parts per million (ppm) are considered poor. Dissolved oxygen problems are generally associated with areas of stagnant, warm water, so decisions regarding the streambank program that influence stream velocity, reaeration potential, and shading could affect dissolved oxygen levels.

b. Turbidity - Turbidity is a measurement of suspended particles in water. It is often an indicator of erosion. High turbidity reduces photosynthesis of submerged rooted aquatic vegetation and algae. Values for turbidity in park streams and river is usually well below dangerous levels, but can be elevated after heavy rainfall. The stabilization of actively eroding banks could potentially reduce turbidity levels.

c. Temperature - Temperature is a standard water quality measure because, in addition to directly affecting the suitability of the water body for supporting aquatic life, temperature affects many other water quality parameters. Temperature standards are specifically based on the month water analysis is recorded. All values of temperature for Park waters are currently within the acceptable range, but could be affected by decisions regarding the condition and character of the riparian corridor.

d. Total Phosphorus - Phosphorus is an indicator of nutrient enrichment and can cause algal blooms or eutrophication in severe situations. Concentrations above 0.1 mg/L in water may promote slime and algal growths, which affect recreational uses. Recent studies in other parts of the U.S. have shown very high concentrations of phosphorus in many floodplain sediments,

particularly when the floodplains have been used for agriculture or receive waters that pass through areas that are actively farmed. Although the levels of phosphorus in the soils adjacent to the Cuyahoga River and its tributaries are not known, it is likely that decisions regarding the control of erosion may affect phosphorus loading to the river.

Water quality impacts attributable to the streambank management program will generally be associated with the reduction in sediment yield to the Cuyahoga River and its tributaries due to stabilization of the banks. The stabilization activities could help reduce the release of contaminants associated with soils in the banks or floodplains, but the locations and concentrations of contaminants are unknown. Because dissolved oxygen, turbidity, and total phosphorous are all related to sediment concentration, and all are adversely impacted by higher sediment concentrations, stabilization could result in a net beneficial impact upon these water quality parameters. Impacts to temperature are mainly derived from alterations to the riparian community and subsequent differences in shading regime, and stabilization activities can affect the composition and character of riparian vegetation.

4.2 Wetlands

Many wetland areas exist in CVNP. A park-wide wetland inventory indicates that more than 1,200 wetland areas encompassing approximately 1,700 acres exist in CVNP (Davey Resource Group, 2001). Most CVNP wetlands are small, with only 190 greater than an acre in size and only 35 greater than 10 acres in size. Additional small wetlands may yet remain undetected.

Wetland types found in the Park include marshes, wet meadows, scrub/shrub wetlands and forested wetlands. Small emergent wetlands occurring in isolated depressions fed by surface water are most common. Small wetlands are also often found at the head of small, intermittent drainageways, adjacent to ponds or as hillside seeps where groundwater flows out of a hillside. Many wetlands are partially or completely forested or include a shrub component. The largest wetlands are located within the Cuyahoga River floodplain and include emergent, shrub, and forested areas. All ponds except one (Oxbow) are human-made (i.e., artificial), with many originally created to serve as small farm ponds. Long-abandoned ponds usually have reverted to a more natural state and now have wetland characteristics. Such ponds are treated as natural wetlands, assigned protective buffers and managed for natural resource values.

Erosion and stabilization of the banks of the Cuyahoga River and its tributaries could affect those wetland resources located in the riparian zone and floodplain of the river. Equipment access for the construction of some stabilization measures under either alternative could temporarily impact these resources, as could actions that alter the hydrology of the surface or ground water. For these reasons, decisions regarding the Riverbank Management Program should consider the potential wetland impacts.

4.3 Floodplains

Of the 32,864 acres in CVNP, approximately 3,574 acres, or 11 percent are in the 100-year floodplain. All of the actions being considered in the Programmatic EA occur within the floodplain of the Cuyahoga River or its tributaries.

Information concerning these floodplains is available from two sources: National Flood Insurance Program (NFIP) Flood Insurance Studies (FIS) for enrolled communities; and hydrologic and hydraulic studies that have been conducted for CVNP as a part of the design of recent or current riverbank stabilization projects. Summit and Cuyahoga Counties are enrolled in the NFIP. Three sections of the Cuyahoga River and/or its tributaries have been studied in detail as part of the NFIP, meaning that a hydraulic model (HEC-RAS or HEC-2) has been developed to calculate water surface elevations, velocities and other hydraulic variables of interest. The first section is the Cuyahoga River from its confluence with Tinkers Creek, downstream to the northern limit of the Park (Village of Valley View FIS). The second section, also of the Cuyahoga River, begins at the northern limit of the City of Akron and extends downstream to the southern limit of the Park (City of Akron FIS). The third is the section of Tinkers Creek within the Village of Valley View (Valley View FIS).

A number of sections of the Cuyahoga River and two major tributaries (Brandywine and Yellow Creeks) have also had detailed hydraulic studies performed in connection with the Riverbank Stabilization Program and a culvert evaluation study, respectively. These studies have utilized portions of the FIS hydraulic models and extended these models using surveyed cross sections and available topographic mapping to specific points of interest along the Cuyahoga River or its tributaries. As CVNP continues to perform hydraulic studies in connection with managing the riverbanks, new hydrology, cross section geometry, reach lengths and other hydraulic information is added to the current HEC-RAS (version 3.0) model thus further extending the limits of the hydraulic model. While the CVNP HEC-RAS model is used in the Riverbank Stabilization Program primarily to design bank protection measures to withstand the water depths, velocities and shear stresses for a range of discharges, the model is also used to "test" proposed actions to determine their impact on the 100-year flood water surface elevation.

4.4 Terrestrial Habitat, Vegetation and Invasive Species

Cuyahoga Valley National Park encompasses a diverse mosaic of natural vegetation types interspersed among various human-developed land uses. Section 4.4.1 of NPS Management Policies (NPS, 2001a) requires the NPS to maintain as parts of the natural ecosystems of parks all native plants and animals by:

- Preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur;

- Restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions; and

- Minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them.

Located in the glaciated Allegheny Plateau of northeastern Ohio, natural vegetation of the Park currently is comprised of approximately 80% mixed-mesophytic forest (Braun, 1961), predominantly of oak-hickory associations but also including maple-oak, oak-beech-maple,

maple-sycamore, pine-spruce, and hemlock-beech associations. The long history of intensive land uses has left the Park with forests possessing vast differences in community age and structure.

The forests of CVNP can be broadly categorized as upland or bottomland forests, based on landscape position. In the upland forests, the dominant vegetation is a mix of hardwood trees, mainly oaks (*Quercus* spp.), hickories (*Carya* spp.), maples (*Acer* spp.) and beech (*Fagus grandifolia*). The groundcover in these upland forests tends to be sparse, consisting of mayapple (*Podophyllum peltatum*), trout-lily (*Erythronium americanum*), spring-beauty (Claytonia virginica), toothworts (*Cardamine* spp.), violets (*Viola* spp.), Jack-in-the-pulpit (*Arisaema triphyllum*), and other herbaceous species. Shrub cover in these areas is also sparse, but when present, consists mainly of maple-leaved viburnum (*Viburnum acerifolium*), spicebush (*Lindera benzoin*), and witch-hazel (*Hamamelis virginiana*).

Bottomland forests, those generally located in the floodplains of the Cuyahoga River and its tributaries, are predominantly vegetated with ash (*Fraxinus* spp.), cottonwood (*Populus deltoide*s), sycamore (*Platanus occidentali*s), box elder (*Acer negundo*), Ohio buckeye (*Aesculus glabra*), silver maple (*Acer saccharinum*) and red maple (*Acer rubrum*). The herbaceous groundcover in these forests tends to be more frequent than in the upland forests. Typical herbaceous species in these areas include enchanter's nightshade (*Circaea lutetiana*), grasses (*Poa* spp.), sedges (*Carex* spp.), violets (*Viola* spp.), moneywort (*Lysimachia nummelaria*), wingstem (*Verbesina alternifolia*), smartweed (*Polygonum* spp.), jewelweed (*Impatiens capensis and Impatiens pallida*), wild onions, garlic and leeks (*allium* spp.), and garlic mustard (*Alliaria petiolata*). Shrub cover is sparse or more frequently absent in these areas, and when present, consists mainly of viburnums (*Viburnum* spp.), honeysuckles (*Lonicera* spp.), privit (*Ligustrum* vulgare), and Japanese multiflora rose (*Rosa multiflora*).

Interspersed among these forests are other natural habitats including open fields, old fields, shrub-scrub areas, as well as wetlands.


Japanese Knotweed above cut bank in Study Reach 4.

Open fields are dominated by grasses (e.g., *Poa trivialis, Poa sylvestris, Panicum virgatum* and *Danthonia spicata*) with many forbs (e.g., *Solidago canadensis, Solidago graminifolia, Aster nova-borensis* and *Apocynum cannibinum*) present as well. In these fields, there is little woody growth as many undergo regular mowing.

Old fields are further along in succession. The ground is covered mostly by grasses and forbs, but also includes brambles (*Rubus* spp.) and a limited amount of shrubby species (e.g., gray dogwood (*Cornus racemos*a), smooth arrow-wood (*Viburnum recognitu*m), common privet (*Ligustrum vulgar*e), oleaster (*Elaeagnus multiflor*a), and autumn olive (*Elaeagnus umbellat*a). Shrubs do not dominate large areas within these fields. Seedlings and saplings of fast-growing trees such as poplars (*Populus* spp.) may be present.

Shrub-scrub habitats possess significant shrub/sapling growth. These are areas in which the majority of the ground is covered with woody growth greater than six feet in height, with a few emergent trees of six to twenty feet in height developing above the shrub layer. These fields are typically vegetated with shrubs and young trees of up to six inches in diameter at breast height (e.g., hawthorn (*Crateagus* spp.), gray dogwood (*Cornus racemos*a), smooth arrow-wood (*Viburnum recognitu*m), common privet (*Ligustrum vulgar*e), oleaster (*Elaeagnus multiflor*a), and autumn olive (*Elaeagnus umbellat*a), red maple (*Acer rubrum*), wild cherry (*Prunus serotina*), oaks (*Quercus* spp.), bigtooth aspen (*Populus grandidentata*) and white ash (*Fraxinus american*a).

Over 940 plant species occur in these various habitats. Approximately 186 of these species are exotic species not native to the area. Of these 186 species of exotic plants, only 14 plant species are currently considered invasive within the Park. These are listed in Table 4-1. These invasive species are found mainly in wetlands, floodplains, river and streambanks, road margins, rights of way, disturbed areas, and along developed trails.

The NPS Management Policies (NPS, 2001a) provide specific guidance for dealing with invasive species. The control of populations of exotic plant and animal species, "up to and including eradication, will be undertaken wherever such species threaten Park resources or public health and when control is prudent and feasible." Examples of threatening situations include: (1) posing a public health hazard or a hazard to public safety; (2) disrupting the accurate preservation of a historic scene; (3) damaging historic or archeological resources; (4) interfering with natural processes and the perpetuation of natural features or native species (especially those that are endangered, threatened, or otherwise unique) and; (5) significantly hampering the management of park or adjacent lands.

Table 4-1. Invasive Plant Species in CVNP.

Scientific Name	**Common Name**
Alliaria petiolata	Garlic mustard
Elaeagnus umbellata	Autumn olive
Lonicera japonica	Japanese honeysuckle
Lonicera maackii	Amur honeysuckle
Lonicera morrowii	Morrow honeysuckle
Lonicera tatarica	Tartan honeysuckle
Lythrum salicaria	Purple loosestrife
Phalaris arundinacea	Reed canary grass
Phragmites australis	Common reed/reed grass
Polygonum cuspidatum	Japanese knotweed
Rhanmus cathartica	European buckthorn
Rhamnus frangula	Glossy buckthorn
Rosa multiflora	Multiflora rose
Typha angustifolia	Narrow-leaved cattail

Five of the 14 invasive plants found in CVNP are potential threats to the native vegetation in the riparian zone, and decisions regarding the Riverbank Management Program could affect the distribution of these invasive species. Japanese honeysuckle occurs at many localities throughout

the area. It is a pernicious and dangerous weed that can overwhelm and strangle the native flora. Purple loosestrife does particularly well in wetlands and has the ability to move rapidly, become firmly established and eliminate other species. Reed canary grass is a significant problem in the Park. This species occurs in more than 160 wetlands throughout the Park, and is beginning to form monocultures over large areas. It tends to move into wetlands after frequent but temporary inundation such as the abandonment of beaver dams. It crowds out other grasses and sedges which have more wildlife value. Giant reed grass forms extensive clones in wet areas such as sedge meadows, fens, wet fields, roadside ditches and floodplains. Japanese knotweed is one of the more pervasive invasives within the riparian corridor. It tends to colonize disturbed areas, and can form extensive populations rapidly - spreading by underground rhizomes. These plants, when present near a project site, can rapidly spread into an area that is disturbed, threatening the integrity of the Park's native plant communities by outcompeting the native plants, supplanting them and transforming diverse habitats into monocultures of invasive plants with minimal wildlife value.

4.5 Aquatic Habitat

The aquatic habitat conditions in a stream reach are the consequence of the processes that create and maintain those conditions. These processes include sedimentation (erosion, transport, deposition, sorting, etc.), hydrodynamics, and morphological evolution. Healthy aquatic habitats are not static but, rather, are very dynamic and heterogeneous both spatially and temporally.

Streambank stabilization affects many of the structural characteristics and functions of a stream. These impacts can be viewed as either adverse or beneficial, depending upon the characteristics of the stabilization method, the stream characteristics, the scale of analysis, and the perspective of the individual assigning values to the system. Fischenich (2003) presented 15 river and riparian functions, against which the impacts of stabilization treatments are assessed. Functions most likely to be impacted by stabilization measures include stream evolution processes, riparian succession, and sedimentation processes. These, in turn, affect habitat conditions and biological community interactions.

Environmental conditions at each site and for each study reach were assessed during a field investigation on October 14-16, 2002. A rapid assessment procedure based on the EPA's Rapid Bioassessment Protocol was used to characterize each site and reach. A scale of 0 – 20 was used for the rating of each factor, with 0 representing the lowest environmental quality and 20 representing the highest attainable quality for the Cuyahoga System. Descriptions of the parameters and their relevance are provided in Appendix B, and the findings of the assessment are summarized in Tables 4-2 and 4-3. This assessment provides a baseline against which the proposed alternatives can be evaluated with respect to aquatic habitat.

Table 4-2. Summary of Assessment Scores by Factor and Reach.

	Cover	Substrate	Morph. Diversity	Veg	Channel Stability	Bank Stability	Riparian Width	Mgt. Potential
Reach 1	17.0	1.0	1.0	17.0	17.0	16.0	8.0	7.0
Reach 2	7.8	9.4	10.5	10.2	11.9	10.1	7.7	8.9
Reach 3	10.5	9.4	8.6	10.3	13.5	12.6	6.0	8.1
Reach 4	12.5	8.7	5.2	11.5	11.0	12.3	13.8	13.2
Reach 5	6.2	6.3	6.4	4.0	9.2	6.4	6.0	13.0
Reach 6	9.4	10.1	11.6	9.9	13.1	10.8	14.2	13.2
Reach 7	13.0	14.0	15.0	9.0	14.3	15.7	11.0	11.3
Reach 8	14.0	14.0	13.0	13.0	12.0	10.0	11.0	13.0

Table 4-3. Summary of Assessment Scores by Factor and Hazard Rating.

	Cover	Substrate	Morphology	Veg	Channel Stability	Bank Stability	Riparian Width	Mgt. Potential
LOW	10.4	8.6	9.3	10.7	13.0	12.0	11.6	12.1
MODERATE	9.0	9.8	10.0	7.7	12.3	10.6	8.6	10.6
HIGH	8.6	8.9	8.1	8.6	11.1	9.6	6.6	9.5

Assessment of the impacts of bank stabilization activities on aquatic habitat can be accomplished by contrasting pre- and post-project values for the eight factors in the above tables. Distinctions among various bank stabilization alternatives can be made on the basis of 1) the specific stabilization measures used, 2) the materials used, 3) their geometry and position in the landscape, and (in some cases) 4) the character of stream reach in which they are applied. Although a distinction may also be made on the basis of when the measures are employed, this factor was not explicitly addressed in this assessment because the timing of future implementations is unknown.

Streambank stabilization affects many of the structural characteristics and functions of a stream and, consequently, impacts aquatic habitat. The basic purpose of any stabilization project is to interrupt erosion processes where they are deemed to conflict with social needs or ecological requirements. These efforts also interrupt or affect other processes and alter the physical environment. Because of the strong interrelations among the structural components and functions of a stream/riparian system, a number of secondary and tertiary impacts are associated with bank stabilization measures. Knowledge of the direct and ancillary impacts of stabilization can be used to select measures and develop designs that avoid or minimize impacts and, in some cases, that restore or enhance the structure and function of a degraded ecosystem.

The impacts associated with the use of riprap, for example, can be minimized by modification of structures used for erosion control. When used as an armor material, riprap impacts can be minimized by reducing the height of the protection, by increasing the slope of the embankment, and by sizing the riprap in order to afford adequate habitat within the aquatic environment. Planting the interstices of a riprap revetment with woody vegetation can also reduce impacts. Similar modifications can be employed to minimize the impacts associated with riprap used as toe protection in a slope stabilization project. Guidance presented in Fischenich (1999, 2001, 2002, and 2003) outlines approaches for assessing the impacts of stabilization measures.

4.6 Federally/State Listed Endangered or Threatened Species

No federally-listed plant species are known to occur in the Park. However, the U. S. Fish and Wildlife Service indicates that the Park is within the range of the federally-threatened northern monkshood (*Aconitum noveboracense*). This plant is found on cool, moist talus slopes or shaded cliff faces in wooded ravines.

Twenty-four state-listed rare plant species are known to occur in CVNP (Table 4-4). These plants occur in various habitats in CVNP. Several of the species occur only in forests, while others are adapted to field habitats.

Wildlife species known to occur in CVNP that are on state and federal lists are shown on Table 4-5. No state- or federal-listed amphibians, fishes, mollusks or arthropods are known to occur in CVNP.

Detections of the federally-threatened bald eagle (*Haliaeetus leucocephalus*) have been limited to one to two non-breeding individuals seen perched near the Cuyahoga River during winter months. No nests have been found within the Park, though nests have been found in neighboring counties. The impact of the Riverbank Management Program on potential nest sites, and the potential indirect impacts to prey should be considered.

The federally-endangered Indiana bat (*Myotis sodalis*) was recently found in the Park. The Park contains an abundance of apparently suitable habitat. Suitable breeding and roosting habitat for Indiana bats can vary widely, but typically consists of large (>10" diameter) trees with peeling bark located near a permanent water source and good foraging areas. Foraging habitat is typically in floodplain forests and riparian areas. Thus, decisions regarding the riverbank management program have the potential to influence habitat availability for this species.

The Park is also within the range of the eastern massasauga (*Sistrurus catenatus catenatus*) rattlesnake, a candidate species for listing under the Endangered Species Act (ESA) and listed as endangered by the State of Ohio. The species has not been detected within the Park, but the type of wet habitat this snake prefers is found in CVNP. There are no federally-designated critical habitats or wilderness areas within the vicinity of the Park.

Piping plover (*Charadrius melodus*) is a federally listed endangered species that occurs in Cuyahoga County, but is not found within the Park. No suitable breeding habitat for piping plovers exists within Park boundaries.

At least 22 bird species that breed in the Park are of conservation concern in Ohio (ODNR, 2002), or at regional and national levels as determined by the international conservation consortium, *Partners in Flight* (Hunter et al., 1993; PIF, 2002). Most of these species of concern have exhibited steep population declines throughout their range or regionally due to habitat loss and degradation. In CVNP, 11 of these species of concern are associated with mature forests, four are dependent on early successional forests, two are specific to grasslands, and four are dependent upon wetland habitats (Table 4-6). Nearly all of these species require relatively large, unbroken tracts of habitat for breeding.

Table 4-4. State-listed Rare Plants Occurring in Cuyahoga Valley National Park.

Common Name (*Scientific Name*)	Status	Habitat
Satin Brome Grass (*Bromus nottawayanus*)*	T	Wooded roadside banks, disturbed floodplains
Drooping Wood Sedge (*Carex arctata*)	E	Forest
Silvery Sedge (*Carex argyrantha*)	P	Forest/Edges
Golden-fruited Sedge (*Carex aurea*)	P	Clearings/open forests
Bebb's Sedge (*Carex Bebbii*)*	P	Sedge Meadows, thickets, alluvial soils
Spotted Coral-root (*Corallorrhiza maculata*)	P	Rich open forests
Rock-harlequin (*Corydalis sempervirens*)	P	Openings/sandstone outcrops
Hairy Tick-trefoil (*Desmodium glabellum*)	A 2003	Dry Woods
Variegated Horsetail (*Equisetum variegatum*)	T	Wetlands/calcareous seeps
Fringed Gentian (*Gentianopsis crinita*)	P	Fields/calcareous seeps/road cuts
Butternut (*Juglans cinerea*)	P	Open or forested floodplains/edges
Greene's Rush(*Juncus greeneii*)*	E	Wet gravelly banks, disturbed calcareous soils
Ground juniper (*Juniperus communis*)	E	Open fields/pastures/open forests
Round-fruited Pinweed (*Lechea intermedia*)	T	Dry eroding slopes/forests
Large-leaved Mountain-rice (*Oryzopsis asperifolia*)*	E	Rich deciduous woods, wooded slopes
Weak Spear Grass (*Poa languida*)	P	Dry Oak forests
Sessile-fruited Arrowhead (*Sagittaria rigida*)	T	Brackish water/muddy banks
Canadian Buffalo Berry (*Shepherdia canadensis*)	P	Full sun/fields/open forests
Leafy Goldenrod (*Solidago squarrosa)*	T	Fields/open areas
Swamp Oats (*Sphenopholis pensylvanica*)	P	Wet areas in full sun
Shining Ladies' Tresses (*Spiranthes lucida*)	P	Wet meadows/lake shores/damp forests/ pastures
Great Plains Ladies' Tresses (*Spiranthes magnicamporum*)	P	Dry, grassy fields
Lesser Ladies' Tresses (*Spiranthes ovalis*)	P	Moist forests/forested pastures/moist fields
Seaside Arrow-grass (*Triglochin maritimum*)*	T	Full sun in calcareous substrates, marshes, fens

(*Occurs within the park, but is not known to occur on NPS land)

State status: E = state endangered, T = state threatened, P = state potentially threatened, A= Added to inventory, but not enough information to assign an endangerment status.

Status source: Ohio Division of Natural Areas and Preserves. 2002. Rare native Ohio Plants: 2002-03 Status List. Ohio Department of Natural Resources, Columbus, OH. 29pp.

Habitat Source: Andreas, B.K. 1986. Botanical Surveys on the Cuyahoga Valley National Recreation Area. Unpublished Doc.; McCance, R.M., Jr. and J.F. Burns, eds. 1984. Ohio Endangered and Threatened Vascular Plants: Abstracts of State-listed Taxa. Division of Natural Areas and Preserves, Department of Natural Resources, Columbus, Ohio. 635 pp.; ODNR Division of Natural Areas and Preserves Website, www.dnr.state.oh.us/dnap.

Table 4-5. Federal and State-listed Wildlife Species Occurring in Cuyahoga Valley National Park.

Common Name (Scientific Name)	Status*	Habitat
Birds		
Bald Eagle (*Haliaeetus leucocephalus*)	T, SE	Lakes, reservoirs, rivers
Osprey (*Pandion haliaetus*)	SE	Lakes, reservoirs, rivers
Cerulean Warbler (*Dendroica cerulea*)	SC	Mature deciduous forest
Prothonotary Warbler (*Protonotaria citrea*)	SC	Forested wetlands, riparian forest
Mammals		
Indiana bat (*Myotis sodalist*)	E, SE	Riparian corridors
Star-nosed mole (*Condylura cristata*)	SC	Wetlands, streams
Reptiles		
Eastern massasauga (*Sistrurus catenatus*)	T, SE	Wetland/upland interface
Spotted turtle (*Clemmys guttata*)	ST	Marshes, bogs, swamps, shallow ponds
Eastern box turtle (*Terrapene Carolina*)	SC	Terrestrial habitats
Blanding's turtle (*Emydoidea blandingii*)	SC	Aquatic - - Marshes, bogs, lakes, streams
*E = Federal Endangered, T = Federal Threatened, SE = State Endangered, ST = State Threatened, SC = Species of Concern in Ohio. Status categories are based on ODNR, 2002.		

Table 4-6. Bird Species of Conservation Concern Known to Breed in CVNP.

Common Name (Scientific Name)	Status*	Habitat
Sora (*Porzana carolina*)	SC	Wetland/Marsh
Virginia rail (*Rallus limicola*)	SC	Wetland/Marsh
American woodcock (*Scolopax minor*)	PIF	Early succession
Sharp-shinned hawk (*Accipiter striatus*)	SC	Forest
Acadian flycatcher (*Empidonax virescens*)	PIF	Forest
Least flycatcher (*Empidonax minimus*)	ST	Early succession
Brown creeper (*Certhia familiaris*)	SI	Forest
Marsh wren (*Cistothorus palustris*)	SC	Wetland/Marsh
Winter wren (*Troglodytes troglodytes*)	SI	Forest
Wood thrush (*Hylocichla mustelina*)	PIF	Forest
Hermit thrush (*Catharus guttatus*)	ST	Forest
Prothonotary Warbler (*Protonotaria citrea*)	SC	Forest Wetland
Golden-winged warbler (*Vermivora chrysoptera*)	SE, PIF	Early succession
Cerulean warbler (*Dendroica cerulea*)	SC, PIF	Forest
Kentucky warbler (*Oporornis formosus*)	PIF	Forest
Canada warbler (*Wilsonia canadensis*)	SI, PIF	Forest
Louisiana waterthrush (*Seiurus motacilla*)	PIF	Forest
Henslow's sparrow (*Ammodramus henslowii*)	SC, PIF	Grassland
Field sparrow (*Spizella pussila*)	PIF	Early succession
Dark-eyed junco (*Junco hyemalis*)	ST	Forest
Bobolink (*Dolichonyx oryzivorus*)	SC	Grassland
Purple finch (*Carpodacus purpureus*)	SI	Forest edge

* SE = Endangered in Ohio, ST = Threatened in Ohio, SC = Species of Concern in Ohio, SI = Special Interest in Ohio (ODNR, 2002); PIF = Partners in Flight bird of conservation concern (Hunter et al., 1993 - current Ohio Hills and Allegheny Plateau physiographic region lists)

4.7 Wildlife

Faunal species that have been detected in the Park include 194 species of birds, 91 aquatic macroinvertebrates, 43 fish, 32 mammals, 22 amphibians, and 20 species of reptiles. In addition, 60 butterfly species have been documented in the Park.

Populations of a number of wildlife species have increased substantially in the last decade both locally and regionally, to the extent that these species have recently reached nuisance levels within the Park. Most notably, raccoons (*Procyon lotor*), woodchucks (*Marmota monax*), Canada geese (*Branta canadensis*), and white-tailed deer (*Odocoileus virginianus*) are ubiquitous throughout the Park, and consistently generate the greatest number of conflicts with humans.

Evidence of beaver activity.

Although very little historical record is available, it is agreed that prior to European settlement, beaver (*Castor canadensis*) were abundant throughout Ohio (King, Bissel, Frank, 1979). However, by 1830, after many years of heavy trapping, beaver had been eliminated from Ohio. It was not until more than 100 years after they were extirpated from the state, that beaver reappeared in 1936 in the eastern counties of Ohio. Beaver probably moved into the Park area within the last ten years, and an initial inventory in 1991 found over 50 active or recently abandoned lodges. Through their dam-building and feeding activities, beaver act as a "Keystone" species, affecting ecosystem structure and dynamics far beyond their immediate requirements for food and cover. The wetlands which beaver construct and maintain for their own protection, also provide a range of habitats suitable for many plant and animal species. Any increase in beaver contributes to the increase of habitat for those species dependent upon wetlands. Decisions regarding the Riverbank Management Program for CVNP could affect and could be affected by beavers within the Park.

Coyotes (*Canis latrans*) are the most dominant carnivore and predator in CVNP ecosystem and are, therefore, a prime contributor to diversity. It is a species that has recently returned to the valley after a long absence. Park residents and visitors frequently report coyote sightings. The Park provides good habitat for the coyote with its many open fields and agricultural landscape, and the public has expressed concerns regarding the impacts of coyotes in the system. However, it is not clear that the proposed Riverbank Management Program will directly affect coyote populations or behavior.

Whitetail deer (*Odocoileus virginianus*) populations in CVNP have been estimated to be as high as 90 deer per square mile. Deer begin affecting people and their environment (especially other wildlife and vegetation) at 10 deer per square mile. Impacts on vegetation and wildlife increase in quantity and severity as populations increase. Coyotes remain their only natural predator, primarily scavenging dead deer or the occasional weak fawn or adult. With few predators to cull

their numbers, the deer population is rising. Deer are herbivores, which graze or browse depending on food availability. In the spring and summer, their diet is primarily grasses and leaves; they eat nuts, woody twigs, and bark in the fall and winter. If there are too many deer, they will over-browse the vegetation, influencing the number and diversity of plant species. This, in turn, can reduce the population of other wildlife such as small mammals and songbirds. Decisions regarding the Riverbank Management Program could potentially influence or be influenced by deer populations.

Ten raptor species are known to be either year-round or summer residents in the Cuyahoga Valley. These species include the great horned owl (*Bubo virginianus*), eastern screech owl (*Otus asio*), barred owl (*Strix varia*), turkey vulture (*Cathartes aura*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo brachyurus*), broad-winged hawk (*Buteo platypterus*), and American kestrel (*Falco sparverius*). These species are either presumed or known to nest in the area, and decisions regarding the management of the riverbanks of the Cuyahoga River could potentially influence the availability of nest sites.

Although fish communities have recovered significantly in historically depleted segments of the Cuyahoga River, pollution-tolerant species continue to dominate the population composition. The Ohio EPA uses a modification of the Index of Biotic Integrity (IBI) specific to Ohio rivers and streams as its principle biological criteria for assessing stream health (Ohio EPA 1996). The IBI is an ecologically based, multimetric index which utilizes fish community data and aggregates results across 12 ecological metrics that can be classified into four categories: species richness, species composition, trophic composition, and fish density and community condition. IBI, as well as ICI and MIwb scores (additional Ohio EPA measures of macroinvertebrate and fish population conditions) in CVNP range from fair to very poor and are generally below applicable Ohio warmwater habitat aquatic life use criteria. Decisions regarding the riverbank management program could both directly and indirectly influence habitat character and quantity and water quality of the Cuyahoga River, with related impacts to the fish community.

Amphibians and, to a lesser extent, reptiles are relatively sedentary and spend much of their time in and around the aquatic and riparian zones within CVNP. Consequently, they are probably more prone to and hence more representative of localized point sources of contamination than other vertebrates. This also makes them more sensitive to the loss and degradation of habitat. Thus, proposed actions under the Riverbank Management Program should carefully consider the potential impacts to amphibians and reptiles.

4.8 Natural River Processes

Proposed actions under either alternative may have an effect on fluvial geomorphologic processes, which for the purposes of this discussion, are referred to as natural river processes. Appendix B provides detailed background information on the fluvial geomorphology of the Cuyahoga River. Highlights from Appendix B are presented in this section. Appendix D contains color photographs of specific sites that are being monitored under the Riverbank Erosion Monitoring Program. Appendix C contains side-by-side historic and current aerial photographs showing changes in their plan form over time.

The Cuyahoga River Valley is characterized by undulating to rolling hills with a level floodplain, terraces, and steeply incised tributaries. Wide expanses of level or nearly level land predominate within the floodplains. These expanses are interrupted by sporadic sandy ridges that are the last remnants of glacial lake beaches. Soils of the valley walls and valley terraces were formed in glacial outwash gravel and sand deposits, or from slack-water deposits of silt and clay or lacustrine material.

The Cuyahoga River generally flows from south to north in CVNP, through a confined valley ranging from 500 to 4200 feet wide. The valley and river are characterized by a gentle gradient predominated by riffle/pool sequences with long intermediate runs. Valley slope and channel slope are 0.14 percent and 0.1 percent, respectively. The river exhibits an irregular meander pattern with oxbows, oxbow lakes, and scars throughout the valley. It is moderately entrenched, with a wide floodplain on the inside meander. Stream banks are predominately vegetated with both herbaceous and woody vegetation. The outside meanders, where the majority of erosion occurs, are typically vertical cut-banks with exposed soils, mature trees and herbaceous vegetation at the top. Numerous locations provide evidence of previous stabilization efforts using measures such as riprap, large rectangular stone, and flow deflection structures, which where placed prior to the NPS taking ownership. Point bars consist of sandy loam mixed with gravel (Bergmann Associates and FIScH Engineering, 2001).

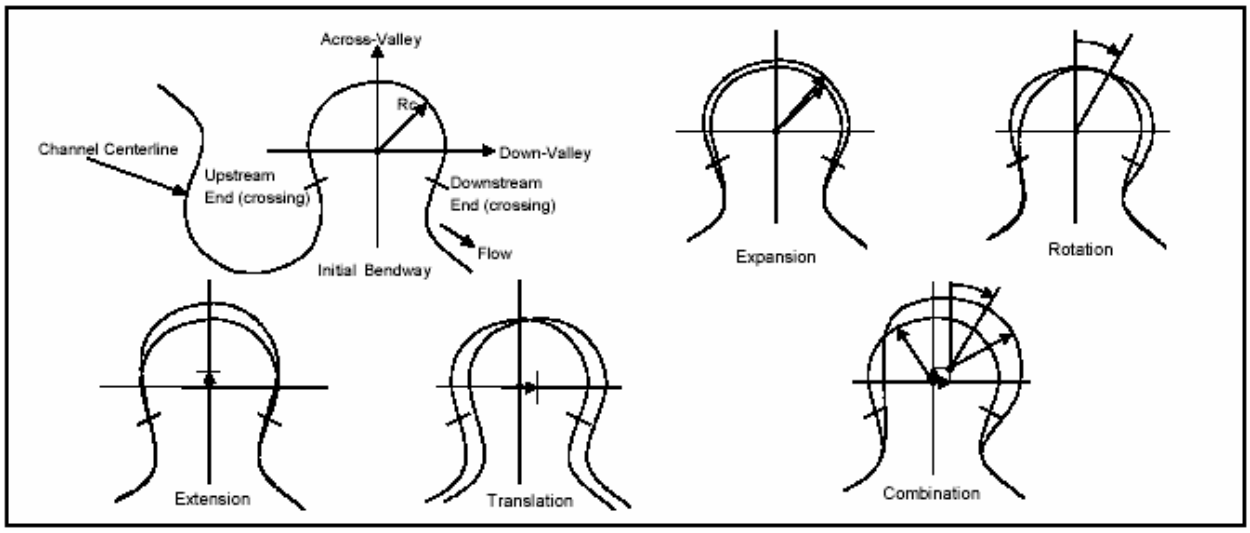
A fluvial geomorphology assessment of the Cuyahoga River was conducted in 1997 (Environmental Design Group and Biohabitats, 1997). The river was classified using the Rosgen Classification System which quantifies a stream's variables, or morphologic characteristics, in varying levels of resolution from broad characterizations to site specific descriptions (Rosgen, 1993). The key variables used in the analysis include gradient, bankfull width and depth, sinuosity, valley confinement, and particle size. Bankfull refers to the discharge that fills a stable alluvial channel up to the elevation of the active floodplain (Fischenich and Allen, 2000). Sinuosity is defined as the stream length divided by the valley length. The first four variables are used to categorize the stream into one of seven major types. The last variable, particle size, is used to further define the stream type. Particle size is the median diameter of channel materials, as sampled from the channel bed surface, between the bankfull stage and thalweg elevations. It was determined that, in general, the river exhibits characteristics of a type C5 morphology within most of CVNP, with some reaches exhibiting a type F5 morphology (Environmental Design Group and Biohabitats, 1997). C5 and F5 streams are typically very highly sensitive to disturbance, have a very high sediment supply, and have a high to very high streambank erosion potential.

The threats to the Valley Railway and Towpath Trail result primarily from the migration of channel meanders. Channel migration includes lateral channel shift (expressed in terms of distance moved perpendicular to the channel center line, per year) and downvalley migration (expressed in distance moved along the valley, per year). The migration of channel meanders can be reasonably described by four modes of movement as shown below.

Bank failure is prevalent along many reaches of the river. The mechanisms include: erosion at the toe (the lowest part of the embankment); erosion of the upper banks; bank failures resulting from mass removal of the toe; translational failures related to seepage lenses in the bank; and

rotational failures due to surcharge loads and moment forces from large trees on the banks. Of these mechanisms, erosion at the toe and translational failures of the upper bank are most prevalent (Bergmann Associates and FIScH Engineering, 2001).

Measuring Meander Migration (Spitz et al., 2001).



The Cuyahoga River within CVNP was divided into the following eight reaches, as shown in Figures 1 – 9, for the purpose of assessing existing conditions and evaluating impacts of proposed actions:

Study Reach 1 - Bath Road to Bolanz Road
Study Reach 2 - Bolanz Road to Peninsula Dam
Study Reach 3 - Peninsula Dam to 2000' downstream of Boston Mills
Study Reach 4 - Boston Mills to 1.5 miles upstream of Brecksville Dam
Study Reach 5 - 1.5 miles upstream of Brecksville Dam to Brecksville Dam
Study Reach 6 - Brecksville Dam to Tinkers Creek
Study Reach 7 - Tinkers Creek to Rockside Road
Study Reach 8 - Rockside Road to northern limit of CVNP

Physical and geomorphological conditions determined during a field visit are summarized, by study reach, in Table 4-7.

The field investigation provided a current and independent assessment of conditions at specific sites that are presently in the Riverbank Erosion Monitoring Program. It also provided a baseline against which the feasible alternatives can be evaluated with respect to their effects on natural river processes. The existing effects on natural river processes are organized in Table 4-8 by study reach in terms of the length of bank armoring and the total river bank length that is armored with riprap, gabions or other revetment divided by the reach length and expressed as a percentage. The source of the armoring (stabilization actions prior to NPS, Riverbank Stabilization Program actions, and stabilization actions planned, designed and approved for construction) is also indicated.

Table 4-7. Summary of Physical Characteristics by Study Reach.

Study Reach	River Mile Upst (mi)	River Mile Dnst (mi)	Elevation Upst (ft.)	Elevation Dnst (ft.)	Valley Length (ft.)	River Length (ft.)	Slope %	Slope (ft/mi)	Sinuosity
1	37.3	33.2	725	709	15000	21600	0.074%	3.9	1.4
2	33.2	29.05	709	684	16900	22100	0.113%	6.0	1.3
3	29.05	26.4	684	648	11300	14500	0.248%	13.1	1.3
4	26.4	22.05	648	626	14700	22700	0.097%	5.1	1.5
5	22.05	20.6	626	626	6500	7600	0.000%	0.0	1.2
6	20.6	16.4	620	610	19600	22900	0.044%	2.3	1.2
7	16.4	13.3	597.46	582.5	12200	16000	0.094%	4.9	1.3
8	13.3	12.3	582.5	582.1	5400	5500	0.007%	0.4	1.0

Table 4-8. Riverbank Armoring (in Feet).

Study Reach	Stabilization Actions Prior to CVNRA	Riverbank Stabilization Program Actions	Planned, Designed & Approved for Construction	Total	Percent Harden-ing (%)
1	775	635	0	1410	3.3
2	255	1080	0	1335	3.0
3	200	2660	0	2860	9.9
4	1335	300	435	2070	4.6
5	570	0	0	570	6.2
6	5230	4155	400	9785	21.4
7	3868	900	720	5488	17.2
8	2130	0	0	2130	19.4
Total	14363	9730	1555	25648	9.6

4.9 Cultural Resources

As stated in the *NPS Cultural Resource Management Guideline* (NPS, 1997), cultural resources are "*…the material evidence of past human activities. Finite and nonrenewable, these tangible resources begin to deteriorate almost from the moment of their creation. Once gone, they cannot be recovered. In keeping with the NPS organic act of 1916 and varied historic preservation laws, park management activities must reflect awareness of the irreplaceable nature of these material resources."* It also states that if these resources "*are degraded or lost, so is the parks' reason for being."* NPS Management Policies categorizes cultural resources as archaeological resources, historic and prehistoric structures, cultural landscapes, museum collections, and ethnographic resources (NPS, 2001a). Cuyahoga Valley National Park has focused its research and planning efforts on the stewardship all of the categories except ethnographic resources to date. In 2004, the regional office plans to begin the park's Ethnographic Study – Overview and Assessment.

Cultural resources at CVNP have been categorized into six primary cultural themes: prehistoric and indigenous cultures, agriculture, transportation, settlement, recreation, and industry (NPS, 1987). These cultural themes identify a resource by its primary historical significance. However, resources often exhibit overlapping cultural themes as their uses and associations have

changed through time. Thus, the cultural resources of CVNP exhibit layers of cultural history that are interwoven.

In this Programmatic EA, the cultural resources likely to be impacted are those archeological resources, historic structures, and cultural landscapes primarily associated with the theme of transportation, i.e.: the Towpath Trail and The Valley Railway. Due to the scope of the Programmatic EA, ethnographic resources will be evaluated on a case by case basis.

CVNP has 424 structures included on the List of Classified Structures (LCS) including 34 entries on the Valley Railway and 43 entries on the Ohio & Erie Canal. The LCS identifies structures that are either currently listed or eligible for listing on the National Register of Historic Places. CVNP also has 67 listings on the National Register of Historic Places. National Register listings generally include multiple property listings, thematic studies, historic districts, historic properties, historic structures, and archeological sites. The Ohio & Erie Canal is listed on the National Register as a thematic study. It has no distinct boundaries and focuses primarily on the canal locks. Although other resources along the canal such as the Towpath Trail, weirs and culverts are not included in the nomination, they are included on the LCS and treated as cultural resources. The Valley Railway, on the other hand, is listed as a historic district. It has a distinct boundary that includes historic resources within such as the rail line, several train depots, bridges, and culverts.

One National Historic Landmark designation also exists in the park. It is the three-mile stretch from Lock 37 to Lock 39 along the Ohio & Erie. No park properties have been listed on the World Heritage List and no Sacred Sites or Indian Trust Resources have been identified in the park.

The park is within the boundaries of the Ohio & Erie Canal National Heritage Corridor. Also, the CanalWay Ohio National Scenic Byway runs through the park.

4.9.1 Historic Structures

In the *NPS Cultural Resource Management Guidelines* (NPS, 1997), a historic structure is defined as "a constructed work…consciously created to serve some human activity." It also notes that "regardless of type, level of significance, or current function, every structure is to receive full consideration for its historical values whenever a decision is made that might affect its integrity. The preservation of historic structures involves two basic concerns: slowing the rate at which historic material is lost, and maintaining historic character." Buildings, monuments, dams, canals, bridges, roads, fences, mounds, structural ruins, and outdoor sculpture are all examples of historic structures.

As mentioned previously, both the Ohio & Erie Canal and the Valley Railway are listed on the National Register of Historic Places. The Ohio & Erie Canal nomination focuses primarily on the canal locks, which are historic structures. In addition, 43 related structures such as the Towpath Trail, weirs and culverts are listed on the LCS and treated as historic structures. The Valley Railway nomination includes various historic structures such as the rail line, several train

depots, bridges and culverts. The LCS lists an additional 34 structures related to the railway that are also treated as historic structures.

CVNP treats all historic structures as cultural resources and therefore, universally applies the Secretary of the Interior's Standards for Historic Preservation.

4.9.2 Cultural Landscapes

As described in the CVNRA Cultural Landscape Report (NPS, 1987), "cultural landscapes can broadly be defined as places which have been settled, controlled, manipulated, or altered [by humans]. The most important cultural landscapes are those which include components, use patterns, and structures of historic significance and physical integrity." "The cultural landscape is a tangible manifestation of human actions and beliefs which have been set against and within the natural landscape."

According to NPS Management Policies (NPS, 2001a) and Cultural Resource Management Guidelines (NPS, 1997), all cultural landscapes are to be managed as cultural resources regardless of the type or level of significance. Management actions are to focus on preserving the physical attributes, biotic systems, and uses of a landscape as they contribute to historic significance. Landscapes differ from other cultural resources as changes from both natural processes and human activities are inherent. Because of this innate dynamic quality, preservation treatments seek to protect and preserve the historic character of a landscape over time through the continuity of distinctive characteristics. Thus, the emphasis is on maintaining the character and feeling rather than on preserving a specific appearance or time period.

Although the National Register nominations for the Ohio & Erie Canal and Valley Railway do not concentrate specifically on the cultural landscape value of these resources, additional study work in the form of Cultural Landscape Reports, indicate that both have significant cultural landscape value, primarily to the park cultural theme of transportation. Their location, setting, and pattern of use on the land have altered the natural landscape and imposed defining characteristics on the environs that are considered to be historically significant. Views and vistas in and out, and through these areas conger distinct feelings and characteristics related to the resources. Thus, these also offer value to the cultural landscape scene.

Decisions regarding riverbank management may continue to alter the general landscape. In areas where the cultural landscape of the canal or railway is concerned, efforts will be made to protect and preserve the cultural landscapes by applying the Secretary of the Interior's Standards for Historic Preservation.

4.9.3 Archeological Resources

In the *NPS Cultural Resource Management Guidelines* (NPS, 1997), archaeological resources "are the remains of past human activity and records documenting the scientific analysis of these remains." It further states, "What matters most about an archeological resource is its potential to describe and explain human behavior." "Park managers are responsible for ensuring that archeological resources under their jurisdiction are identified, protected, preserved, and interpreted. This is done through a systematic program of inventory, evaluation, documentation, curation of collections and associated records, nomination of eligible resources to the National Register of Historic Places, monitoring, protection, treatment, and interpretation."

Archeological resources are distributed throughout CVNP. More than half (51%) of the Park has been archeologically surveyed. A total of 289 archeological sites have been recorded including prehistoric and historic sites. Five archeological sites are listed in the National Register of Historic Places. Only 10 percent of the known archeological sites within the park are within the riparian zone. Two known archeological sites are within one meander length of the areas which are monitored for riverbank erosion. If and when these sites are intended to be stabilized, CVNP will coordinate with the NPS Midwest Region Archeological Center and the State Historic Preservation Office to ensure they are not disturbed.

In general, most archaeological survey work at CVNP occurs in conjunction with projects that require ground disturbance. Section 106 of the NHPA requires federal agencies to take into account the effects of undertaking on properties included in or eligible for the National Register of Historic Places. The planning process in relation to these projects typically provides for archaeological inventory work to be completed prior to the actual ground disturbing activity. This inventory work is the initial step taken to provide data about the location of resources and the level of significance. In turn, potential impacts on archaeological resources are reduced through measures such as site avoidance, project redesign, or other site protection measures. Currently, the only long-term archaeological monitoring occurs in relation to actively cultivated farm fields where the fields are inventoried annually to compare and record findings over time.

Decisions regarding the management of riverbank erosion may involve ground disturbance where none has previously occurred. Furthermore, under the Riverbank Management Alternative, archaeological sites may be protected from the erosive forces of the river. Therefore, archaeological resources should be considered in making such decisions.

4.10 Human Health and Safety

In the situation where the a cultural or recreational resource such as the Towpath Trail or the Valley Railway are in jeopardy of being damaged or destroyed by the erosional effects of the Cuyahoga River and its tributaries, there are also potential threats to employee and visitor safety. Tripping and falling hazards can develop quickly along a severely eroding bank, and excessive settling along the Valley Railway can result in track instability. Therefore, decisions regarding the riverbank management program should consider their impact on human health and safety.

4.11 Visitor Use/Experience

Visitors come to CVNP to use and experience the Park in many different ways, but these translate into what they come to "see" and "do." These park resources can be divided into two main categories: scenic values and recreational activities. Annual Visitor Use Surveys conducted by the NPS provide information about the multitude of reasons why visitors come to CVNP, which include various types of recreational activities, educational programs, and relaxing and enjoying nature.

Walking, running, biking, and hiking on the Ohio & Erie Canal Towpath Trail is very popular. Indeed, the Towpath Trail is probably the most significant recreational resource in the Park. When the towpath reconstruction was complete in 1993, park visitation increased by 1 million visitors that year alone (Schleicher et al., 1994). More than 100 miles of other trails traverse the CVNP landscape. Visitors hike, run, and cross-country ski along many of these trails, but many enjoy exploring the Park by going “off-trial.”

Many visitors come to observe the abundant wildlife. Wildlife species that are most often viewed by visitors are white-tailed deer, beaver, and great blue heron. A large beaver marsh with an active lodge is established as a public wildlife viewing area. Two large heron rookeries are present, one of which (at Bath Road) is established as a viewing area with interpretive signage. Wildlife-viewing visitors also include a large number of amateur birdwatchers.

Other common activities include dog-walking, picnicking, fishing, canoeing, driving, relaxing, and attending park-sponsored programs. Many visitors enjoy learning about nature, history, or culture through ranger-led programs and hikes and visits to the Park's four Visitor Centers.

Visitors also come to CVNP to participate in programs offered by the Park's many partners, such as Hale Farm & Village, Cuyahoga Valley Scenic Railroad, and Cuyahoga Valley Environmental Education Center, to name a few.

The NPS discourages using the Cuyahoga River for canoeing and kayaking at this time, due to highly variable water quality. Combined Sewers Overflows located upstream of the Park, discharge into the river during rainfall events. Contamination of the river from that source and from others occurs in an unpredictable fashion, making it impossible to predict safe canoeing conditions.

Damage or destruction of the Towpath Trail or Valley Railway by the erosional effects of the river would result in an impact in the use of these resources by visitors. Therefore, decisions regarding the riverbank management program should consider their impact on visitor use/experience.